Frances Knoll Subdivision

CEQA Preliminary Hydrology/Drainage Study

Prepared for

The County of San Diego

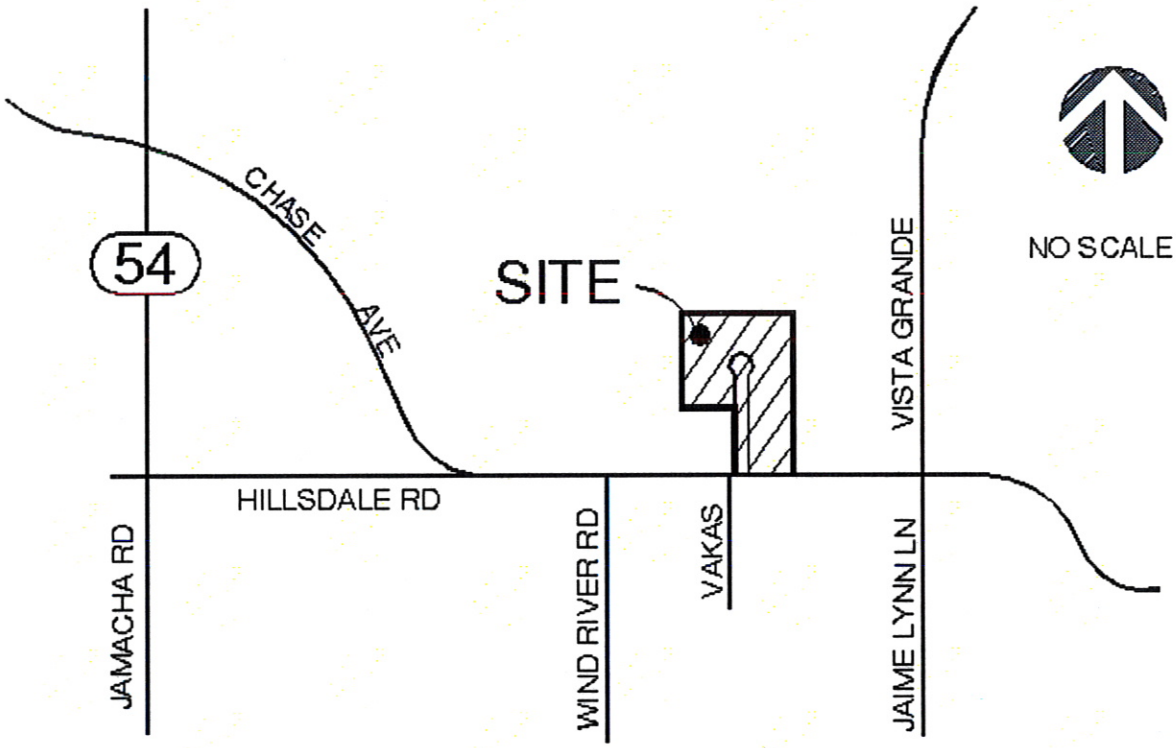
TM 5482 RPL 1

Date: February 6, 2009
Prepared by Lintvedt, McColl & Associates
2810 Camino Del Rio South, Suite 200
San Diego, Ca 92108
(619) 294-4440

LINTVEDT, McCOLL & ASSOCIATES
a David Evans and Associates, Inc. Company

TABLE OF CONTENTS

Vicinity Map



Introduction

The project site is located at the top of a gently sloping knoll on the north side of Hillsdale Road approximately 600 feet west of Vista Grande Road. The 4.01 acre site will be subdivided into five residential lots. Approximately 70% of the site sheet flows to the west to an existing trailer park development. The remaining 30% sheet flows to a public storm drain system in Hillsdale Road. Both sub-basins ultimately drain to a concrete-lined open channel at the easterly side of Valhalla High School approximately 1200 feet downstream. The project has been designed to:

- Maintain the same drainage basin areas
- Use pervious surface on driveways and private road to lessen the impact of development.
- Lengthen the time of concentration to offset increases in pervious surfaces thus maintaining similar peak rates of runoff for pre and post construction conditions.

Purpose and Scope

The Project will subdivide an existing underdeveloped parcel. The total impervious area will increase as a result of development and total volume of runoff leaving the site will increase accordingly. The purpose of this study is to quantify the runoff volumes

and the peak runoff rates for both the existing and developed conditions and to outline the methods to mitigate the impacts of development. Volumes and peak runoff rates are calculated for 100-year, 10-year, and 5-year storm events. Volume, peak rate, and velocity comparisons are measured at the existing downstream storm drain system connection on Hillsdale Road and at the point of concentration in the existing trailer park to the west. The project has been designed to maintain or decrease the peak rate of runoff leaving the site, therefore the capacity of the existing systems downstream will not be adversely affected and a detailed study of these systems is not included in this report.

Existing Conditions

The project site is located at the top of a knoll on the north side of Hillsdale Road. Approximately 70% of the site flows to the west as defined by Basin A and shown on the Existing Conditions Basin Map (See Appendix). The remaining 30% defined as Basin B flows to southerly to Hillsdale Road.

Runoff from Basin A sheet flows to the west over the gently sloping project site. Flows continue down a 10 foot to 12 foot high cut slope on the trailer park site and are captured in an earthen swale at the bottom of the slope adjacent to the parking lot. The earthen swale conveys runoff southerly to an outlet to a concrete swale in the parking lot. Flows continue westerly through the parking lot swale to an unlined drainage channel at the west property line of the trailer park. The unlined channel conveys runoff

from the drainage basin westerly for approximately 350 feet and joins the lined channel system.

Runoff from Basin B sheet flows to the south. Portions of the basin flows are collected in concrete brow ditch just east of the property line. The existing brow ditch directs flows southerly to Hillsdale Road. Runoff from the majority of the basin sheets directly to Hillsdale Road. Runoff is conveyed easterly in the Hillsdale Road gutter to an existing curb inlet approximately 60 feet east of the project boundary. Runoff is conveyed in a series of underground storm drain systems and concrete channels to the main concrete lined channel system at the east side of Valhalla High School. See overall drainage area map in the Appendix.

Proposed Conditions

The site has been designed to maintain the existing drainage patterns and drainage basin areas. The pad grading is designed to create a ridge on lots 1 and 5 to maintain the Basin A area at 2.9 acres and Basin B at 1.2 acres. The minimum half acre lot size allows for large flat pad areas. The developed pads are flatter than the natural condition thus slowing the flow velocities. Flows are conveyed from the pad areas to the project outlet point in a cobble lined ditch around the project perimeter. The cobble lining further reduces the flow velocity. The lower flow velocities for the initial time of concentration from the pads, the addition travel length and lower velocities in cobble lined ditch serve to increase the time of concentration significantly as compared to the

existing condition. Runoff from the site is intercepted at the top of the existing cut slope and directed away from the area to reduce erosion. The outlet to the trailer park is controlled in a concrete brow ditch and outlet directly to the existing concrete swale in the parking lot. On site detention systems will be used to further reduce the peak rate of runoff leaving the site from Basin A by 40%. The detailed detention system calculations are shown in the Storm Water Management Plan.

Drainage from Basin "B" will continue to flow to Hillsdale Road. Porous paving will be used in the upper portion of the private road where grades allow for proper function to reduce the runoff coefficient. Approximately 65% of the basin will remain in landscaped open space designed for passive recreation use. The wide vegetated swales will filter runoff and reduce flow velocities, thus reducing the overall travel time and time of concentration for the basin. Flows from Basin B will be collected in a new storm drain inlet at the curb return and conveyed approximately 80 feet to the existing storm drain system in Hillsdale Road.

Methodology and Calculations

The hydrology calculations were prepared in accordance with the County of San Diego Drainage Design Manual dated June 2003. Base maps were prepared to define the basin areas using the project flown aerial topography maps and tentative map grading design.

Flow rates were calculated using the rational method, Q=CIA, with 'C' being the runoff coefficient, 'I' being the intensity, and 'A' being the drainage area in acres. The 'C' values are based on Soil Type "C" and on Table 3.1 of the hydrology manual. A weighted 'C' value is calculated by averaging the amount of pervious area and impervious area and the 'C' values from Table 3.1. The intensities are calculated based on the County of San Diego Hydrology Manual where $I = 7.44\ P_6 D^{-0.645}$, P6 is the 6 hour precipitation in inches and 'D' is the Time of Concentration of the storm in minutes. See the appendix for figure 3-1 of the San Diego County Hydrology Manual and spreadsheet containing assumptions made for the calculations.

Conclusions & Recommendations

The total area of impervious surface will increase as a result of development and the coefficient of runoff will increase accordingly. The runoff coefficient for Basin A will increase from 0.3 to 0.42 and Basin B will increase from 0.36 to 0.46. Pervious paving will be used in the residential driveways and in the flatter part of the private street to minimize the increase in impervious area. The grading design for the building areas maximizes sheet flow. Vegetated swales and cobble lined ditches are used to convey runoff in lieu of underground systems. The associated increase in travel time serves to decrease the peak intensity in the basin limiting the peak rate of runoff increase to 5% without detention. On site detention systems will be provided to divert 40% of the flow. The capacity provided accommodates the peak 10 year twenty-four hour intensity as

well as the peak 100 year six hour intensity. The addition of onsite detention further reduces the peak rate of runoff to a level that is 39% less than existing conditions. Runoff is outlet from the site to an existing concrete swale that is tributary to an unlined channel. Because the peak rates of runoff and corresponding velocities will be decreased there the downstream erosion potential is also decreased.

The new impervious area within Basin B will be limited to the new roadway. The flatter portions of the private road will be paved with pervious paving to minimize the impact. The remainder of the basin will remain landscaped open space with passive recreational uses. The overall velocity of flow will decrease and the travel length will increase as a result of the development. The net result is a 27% decrease in the peak 100-year rate of runoff from Basin B. The total volume of runoff for the entire storm will increase by approximately 28% due to the increase in impervious area. The total site area is 4.1 acres therefore the project is not subject to the LID limitations on total volume increase of runoff. The slower travel times and slower release rate of runoff from the basin is considered adequate mitigation for the increase in impervious surface. Flow is tributary to an existing underground storm drain and lined channel system. No erosion is expected to occur as a result of the development.

The following table shows a comparison of pre and post development conditions.

Peak Rate of Runoff at Point of Concentration					
Six Hour Storm Event	**Existing Condition CFS**	**Proposed without Detention CFS**	**Percentage Change**	**Proposed with Detention CFS**	**Percentage Change**
Basin A					
Q 100	4.1	4.3	5%	2.6	39%
Q 10	2.7	2.9	5%	1.7	-39%
Q 5	2.4	2.5	5%	1.5	-39%
Q 2	1.8	1.9	5%	1.1	-39%
Basin B					
Q 100	3.1	2.3	-27%	NA	NA
Q 10	2.1	1.5	-27%	NA	NA
Q 5	1.8	1.3	-27%	NA	NA
Q 2	1.4	1.0	-27%	NA	NA

A Storm Water Management Plan has been prepared for the project to provide measures to treat runoff before leaving the site. Construction BMPs are provided to prevent siltation during construction. With the approved erosion control measures in place and monitoring in accordance with the plan, the potential for erosion and siltation from the site during construction will be mitigated to a level that is not significant.

CEQA Question Responses

Would the project:

1) *Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner, which would result in substantial erosion or siltation on- or off-site?*

This project is designed to maintain the existing general drainage patterns. The drainage basin is split with flow to the north and west. The proposed drainage basin areas are the same as the existing drainage basin areas.

2) Substantially alter the existing drainage pattern of the site area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or off-site?

This project is designed to maintain the existing general drainage patterns. The site is at the top of a knoll. There are no creeks or streams in the project area. The peak rate of runoff will decrease as a result of development therefore, no increased flooding will occur off site as a result of the development.

3) Create or contribute runoff water which would exceed the capacity of existing or planned storm water drainage systems?

This project is designed to decrease the peak rate of runoff. Using detention pipes on each lot will mitigate the increase in the volume of runoff from Basin A. The existing down stream facilities will not be impacted by the project.

4) Place housing within a 100-year flood hazard area as mapped on federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map, including Count Floodplain Maps?

The project is located at the top of a ridgeline and is not in or near any FEMA flood hazard area.

5) Place within a 100-year flood hazard area structures that would impede or redirect flood flows?

The project is located at the top of a ridgeline and is not in or near any FEMA flood hazard area.

6) Expose people or structures to a significant risk of loss, injury, or death involving flooding, including flooding as a result of the failure of a levee or dam on-site or off-site?

The project is located at the top of a ridgeline and is not in or near any FEMA flood hazard area nor is it downstream of any levee or dam.

Works Cited

Brater and King. Handbook of Hydraulics, Sixth Edition.

San Diego County Hydrology Manual

APPENDICES

APPENDIX A

Calcs By:	AMJ
Checked By:	P.MCCOLL
Job No.	12511
Date:	2/2/2009

FRANCIS KNOLL SUBDIVISION

EXISTING RUNOFF CALCULATIONS

BASIN A		DESIGN YEAR	P 6 HR STORM	INTENSITY	BASIN Q
AREA	2.9	Q100	2.7	4.7	4.1
RUNOFF COEF.	0.30	Q10	1.8	3.1	2.7
Tc	10	Q5	1.6	2.8	2.4
		Q2	1.2	2.1	1.8
		0.2*Q5	1.6	2.8	0.5

BASIN B		DESIGN YEAR	P 6 HR STORM	INTENSITY	BASIN Q
AREA	1.2	Q100	2.7	7.1	3.1
RUNOFF COEF.	0.36	Q10	1.8	4.8	2.1
Tc	5	Q5	1.6	4.2	1.8
		Q2	1.2	3.2	1.4
		0.2*Q5	1.6	4.2	0.4

Calculations in this table are based on the County of San Diego's Rational Method with the following

1. Q = CIA = Runoff Coefficient * Intensity * Area
2. Runoff Coefficient "C: is based on the County of San Diego Hydrology Manual. See Runoff Coefficient Calculations and Basin breakdown by impervious area.
3. Time of Concentration (Tc) for basins that are realatively small are assumed 5 minutes.
4. Intensity is estimated as $I = (7.44P_{6hr})/Tc^{0.645}$ the Intensity equation from the County of San Diego Hydrology Manual

Calcs By:	AMJ
Checked By:	P.MCCOLL
Job No.	12511
Date:	2/2/2009

FRANCIS KNOLL SUBDIVISION

PROPOSED RUNOFF CALCULATIONS

BASIN A	
AREA	2.9
RUNOFF COEF.	0.42
Tc	15

DESIGN YEAR	P 6 HR STORM	INTENSITY	BASIN Q
Q100	2.7	3.5	4.3
Q10	1.8	2.3	2.9
Q5	1.6	2.1	2.5
Q2	1.2	1.6	1.9
0.2*Q5	1.6	2.1	0.5

BASIN B	
AREA	1.2
RUNOFF COEF.	0.46
Tc	12

DESIGN YEAR	P 6 HR STORM	INTENSITY	BASIN Q
Q100	2.7	4.1	2.3
Q10	1.8	2.7	1.5
Q5	1.6	2.4	1.3
Q2	1.2	1.8	1.0
0.2*Q5	1.6	2.4	0.3

Calculations in this table are based on the County of San Diego's Rational Method with the following

1. Q = CIA = Runoff Coefficient * Intensity * Area
2. Runoff Coefficient "C: is based on the County of San Diego Hydrology Manual. See Runoff Coefficient Calculations and Basin breakdown by impervious area.
3. Time of Concentration (Tc) for basins that are realatively small are assumed 5 minutes.
4. Intensity is estimated as $I = (7.44P_{6hr})/Tc^{0.645}$ the Intensity equation from the County of San Diego Hydrology Manual

APPENDIX B

EXIST EARTH SWALE
L=225' 2%

524.0

528.0

BASIN A
A=2.9 ACRES
Q_{100} =4.6 CFS
Q_{10} =3.0 CFS

L=230'

554.0

550.0

T_i L=40'

BASIN B
A=1.2 ACRES
Q_{100} =3.1 CFS
Q_{10} =2.0 CFS

T_T L=210'

538.5

L=100'

548.0

522.0

EXIST BROW DITCH

EXIST. 36" CIPP

EXIST. B-1 INLET

EXIST. 50"x31" CMPA

EXIST. 15' B-2 INLET

LEGEND:

BASIN A — BASIN NAME

DRAINAGE BASIN

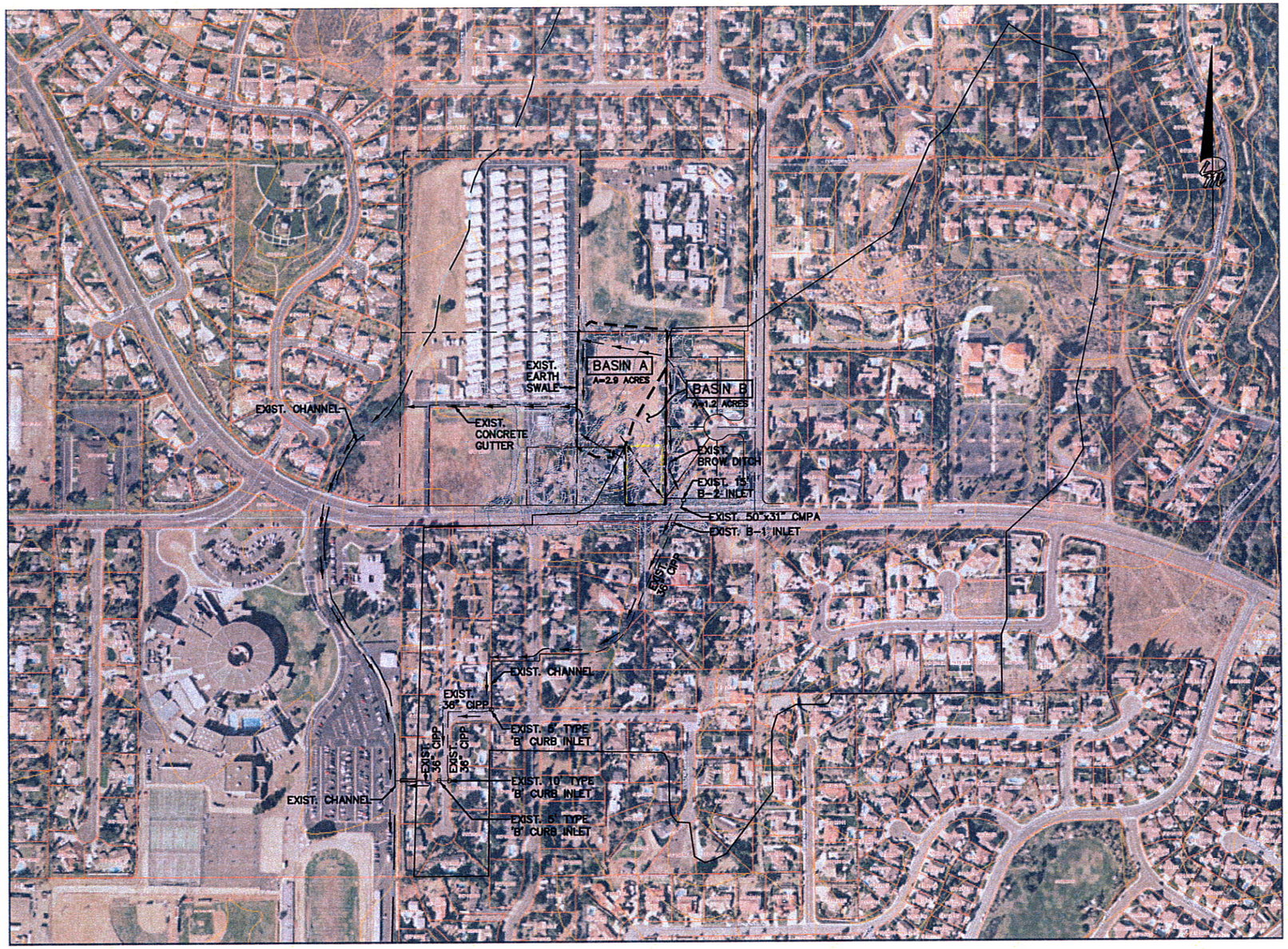
60 0 60 180

Scale 1"=60'

EXISTING CONDITIONS

DATE: 2-10-09	W.O. 12511	DRFT: MD	CHK'D BY: AJ

LINTVEDT, McCOLL & ASSOCIATES
■PLANNING ■CIVIL ENGINEERING ■LAND SURVEYING
2810 Camino Del Rio South, Suite 200, San Diego, CA 92108 ☎(619)294-4440 FAX(619)294-4442



LEGEND:

- BASIN A — BASIN NAME
- DRAINAGE BASIN
- SUB-AREA DRAINAGE BASIN
- EXISTING CHANNEL
- FLOW DIRECTION

200 0 200 400

Scale 1"=200'

EXISTING CONDITIONS

DATE: 2-10-09	W.O. 12511	DRFT: MC	CHK'D BY: AJ

LINTVEDT, McCOLL & ASSOCIATES
•PLANNING •CIVIL ENGINEERING •LAND SURVEYING
2810 Camino Del Rio South, Suite 200, San Diego, CA 92108 P(619)294-4440 F(619)294-4442

PROPOSED CONDITIONS

LEGEND:

- BASIN A — BASIN NAME
- DRAINAGE BASIN
- (2) — LOT NUMBER
- (539) — PAD ELEVATION

HILLSDALE ROAD

CONCRETE BROW DITCH

524.0 FL

L=390'

COBBLE LINED DITCH

COBBLE LINED SWALE

532.0 FL

533.2 IE

20'

GRASS BIOSWALE (TYP.)

120' PIPE

536.4 TG
534.4 IE

BASIN B
AREA=1.2 AC.
Q_{100}= 2.2 CFS
Q_{10} = 1.5 CFS

BASIN A
AREA=2.9 AC.
Q_{100}= 4.3 CFS
Q_{10} = 2.8 CFS

539.5
70' ti
538.8 FL
RIDGE LINE
L=240'
GRASS SWALE

538.8

539.5
70' ti

GATE

525
525.0
530
535
535.0
537.4 TG

60' DITCH @ 5%
80' DITCH @ 12.5%
70' PIPE
140' GRASS SWALE

60 0 60 180

Scale 1"=60'

DATE: 2-10-09	W.O. 12511	DRFT: MC	CHK'D BY: AJ

LINTVEDT, McCOLL & ASSOCIATES
PLANNING
CIVIL ENGINEERING
LAND SURVEYING
2810 Camino Del Rio South, Suite 200, San Diego, CA 92108 tel(619)294-4440 fax(619)294-4442

APPENDIX C

HYDROLOGY CALCULATIONS FOR FRANCES KNOLL SUBDIVISION

TIME OF CONCENTRATION CALCULATIONS

			OVERLAND FLOW (initial time of concentration)			OVERLAND FLOW - NATURAL AREAS			DITCH FLOW					PIPE FLOW					Calculated Tc
BASIN NAME	A AREA (ACRE)	C RUNOFF COEFF.	H HEIGHT (FT)	L LENGTH (FT)	Tc TIME (MIN)	H HEIGHT (FT)	L LENGTH (FT)	Tc TIME (MIN)	AVG. SLOPE (%)	N ROUGH-NESS	LENGTH (FT)	VELOC. (FT/SEC)	Tc (MIN)	S AVG. SLOPE (%)	N ROUGH-NESS	L LENGTH (FT)	V VELOCITY (FT/SEC)	Tc TIME (MIN)	Tc (surf) TOTAL
EXISTING CONDITIONS																			
A	2.9	0.30	9.5	100.0	6.9	10.5	230.0	1.7	2.0%	0.030	225.0	3.6	1.0						10
B	1.2	0.36	4.0	40.0	3.9	28.0	210.0	1.0											5
PROPOSED CONDITIONS																			
A	2.9	0.42	0.7	70.0	10.2	GRASS SWALE			1.0%	0.030	240.0	3.0	1.3	0.01	0.012	120.00	1.6	1.3	
						COBBLE SWALE			2.0%	0.040	390.0	3.1	2.1						
																		TOTAL	15
B	1.2	0.46	0.7	70.0	9.6	GRASS SWALE			1.0%	0.030	140.0	2.5	0.9	1.0%	0.012	70	1.6	0.7	
						LANDSCAPED SWALE			12.5%	0.030	80.0	6.4	0.2						
						LANDSCAPED SWALE			5.0%	0.030	60.0	4.5	0.2						
																		TOTAL	12

1. Q = CIA=Runoff Coefficient * Intensity * Area
2. Runoff Coefficient "C: is based on the County of San Diego Hydrology Manual. See Appendix for County Chart and Basin breakdown by development type.
3. Time of Concentration (Tc) for Urban Areas Overland Flow is based on the formula in the County of San Diego Drainage Manual Chart.

   Tc =(1.8(1.1-C)D1/2/S1/3)
4. Time of Concentration (Tc) for Overland Flow-Natural is based on the formula in the County of San Diego Drainage Manual Chart. $Tc=(11.9L^3/H)^{0.385}$
5. Time of Concentration (Tc) for Gutter Flow, Ditch Flow and Pipe Flow is based on Tc= Travel Length \Velocity where velocity is estimated based on slope.
6. Pipe flow Time of Concentration Tc= Travel Length / Velocity.
7. P 6 Hour storm is taken from the County of San Diego Drainage Manual Isopluvial Maps for the Design Storm. See copy in Appendix
8. Intensity (I) is based on the formula in the County of San Diego Hydrology Manual $I = 7.44\ (P_6)\ D^{-.645}$

APPENDIX D

RUNOFF COEFFICIENT CALCULATIONS EXISTING CONDITIONS				
	Spinali Property		Date:	12/19/2008
			W.O. #	12511
			Calc'd by:	AJ
	Soil Type C		Checked by:	PM
Basin Designation	**Development Type**	**Run off Coefficient "C"**	**% of Basin Area**	**Adjusted "C"**
A	Undeveloped	0.3	100%	0.30
				0.30
B	Developed (1.0 DU/A or less)	0.36	100%	0.36
				0.36
RUNOFF COEFFICIENT CALCULATIONS PROPOSED CONDITIONS				
A	Developed (2.0 DU/A or less)	0.42	100%	0.42
Weighted "C"				
B	Open space	0.3	40%	0.12
	Pervious Pavement	0.3	15%	0.05
	Developed (2.0 DU/A or less)	0.42	25%	0.11
	Impervious Pavement	0.95	20%	0.19
				0.46

RUNOFF COEFFICIENTS FOR URBAN AREAS

Land Use	Runoff Coefficient "C"				
		Soil Type			
	% IMPER.	A	B	C	D
Permanent Open Space	0*	0.20	0.25	0.30	0.35
Residential, 1.0 DU/A or less	10	0.27	0.32	0.36	0.41
Residential, 2.0 DU/A or less	20	0.34	0.38	0.42	0.46
Residential, 2.9 DU/A or less	25	0.38	0.41	0.45	0.49
Residential, 4.3 DU/A or less	30	0.41	0.45	0.48	0.52
Residential, 7.3 SU/A or less	40	0.48	0.51	0.54	0.57
Residential, 10.9 DU/A or less	45	0.52	0.54	0.57	0.60
Residential, 14.5 DU/A or less	50	0.55	0.58	0.60	0.63
Residential, 24.0 DU/A or less	65	0.66	0.67	0.69	0.71
Residential, 43.0 DU/A or less	80	0.76	0.77	0.78	0.79
Neighborhood Commercial	80	0.76	0.77	0.78	0.79
General Commercial	85	0.80	0.80	0.81	0.82
Office Professional/ Comercial	90	0.83	0.84	0.84	0.85
Limited Industrial	90	0.83	0.84	0.84	0.85
General Industrial	95	0.87	0.87	0.87	0.87

Note: This data is taken from the San Diego County Hydrology Manual dated June, 2003

APPENDIX E

BASIN A

C=0.30 (UNDEVELOPED)

EXISTING HOUSE

C=0.36 (1 DU/ACRE)

BASIN B

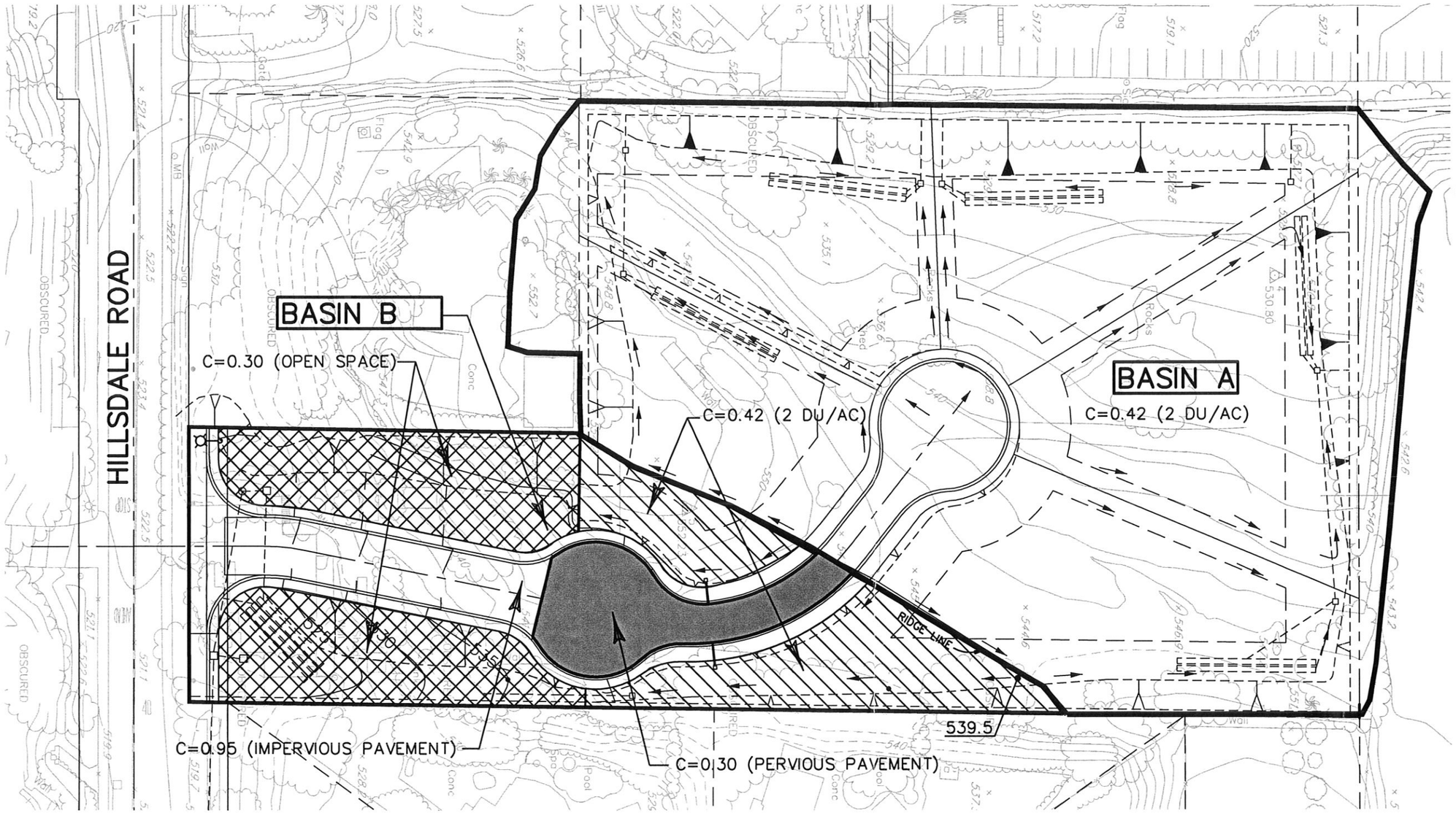
60 0 60 180

Scale 1"=60'

RUNOFF COEFFICIENT
EXIST. CONDITIONS
SOIL TYPE "C"

DATE: 12-22-08 | W.O. 12511 | DRFT: MD | CHK'D BY: AJ

LINTVEDT, McCOLL & ASSOCIATES
PLANNING
CIVIL ENGINEERING
LAND SURVEYING
2810 Camino Del Rio South, Suite 200, San Diego, CA 92108 tel(619)294-4440 fax(619)294-4442



LEGEND:

BASIN A — BASIN NAME

DRAINAGE BASIN

60 0 60 180

Scale 1"=60'

RUNOFF COEFFICIENT PROP. CONDITIONS SOIL TYPE "C"

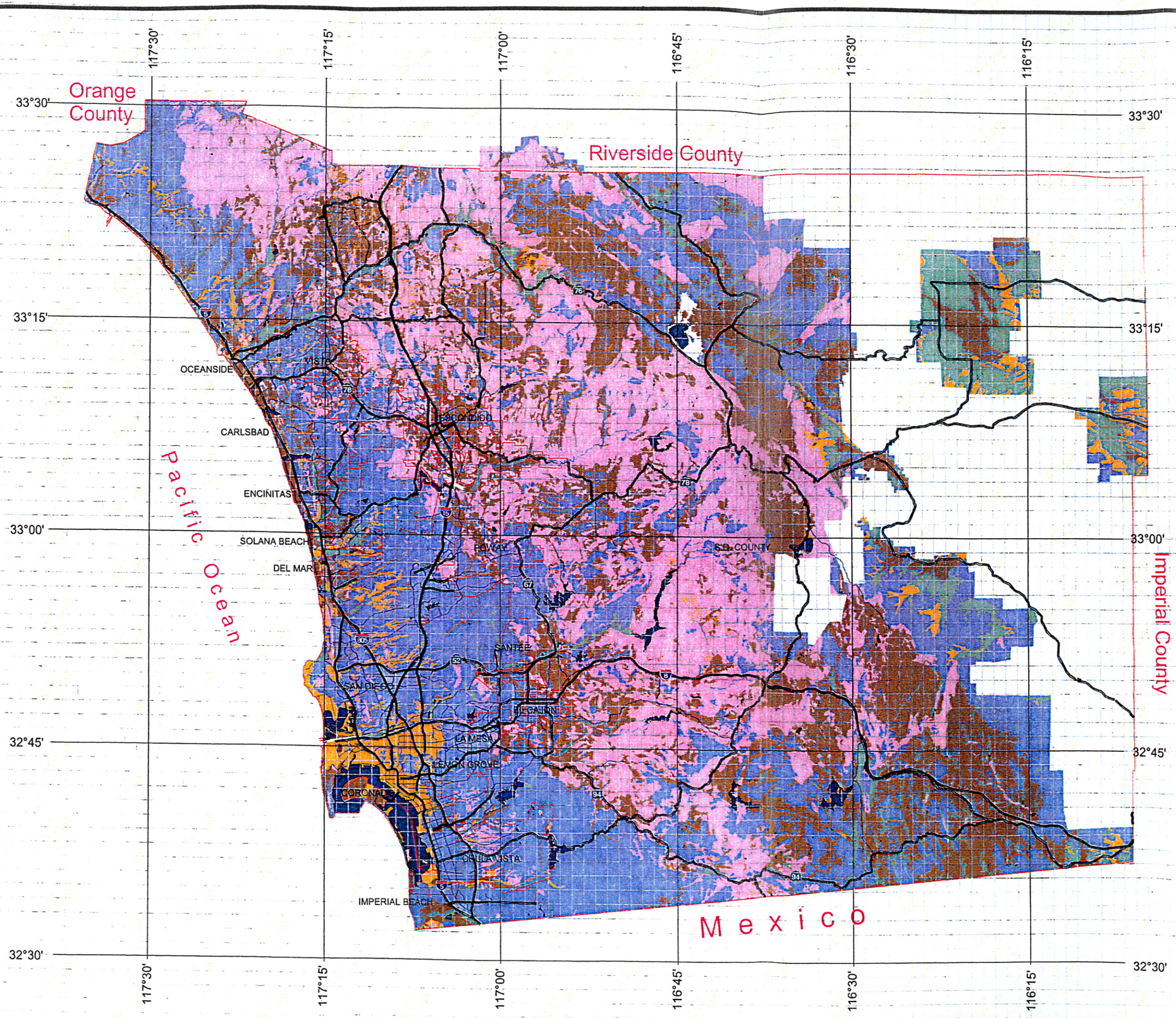
DATE:12-05-08	W.O. 12511	DRFT: MC	CHK'D BY: AJ

LINTVEDT, McCOLL & ASSOCIATES
PLANNING
CIVIL ENGINEERING
LAND SURVEYING
2810 Camino Del Rio South, Suite 200, San Diego, CA 92108 (619)294-4440 Fax(619)294-4442

APPENDIX F

County of San Diego Hydrology Manual

Soil Hydrologic Groups



Legend

Soil Groups

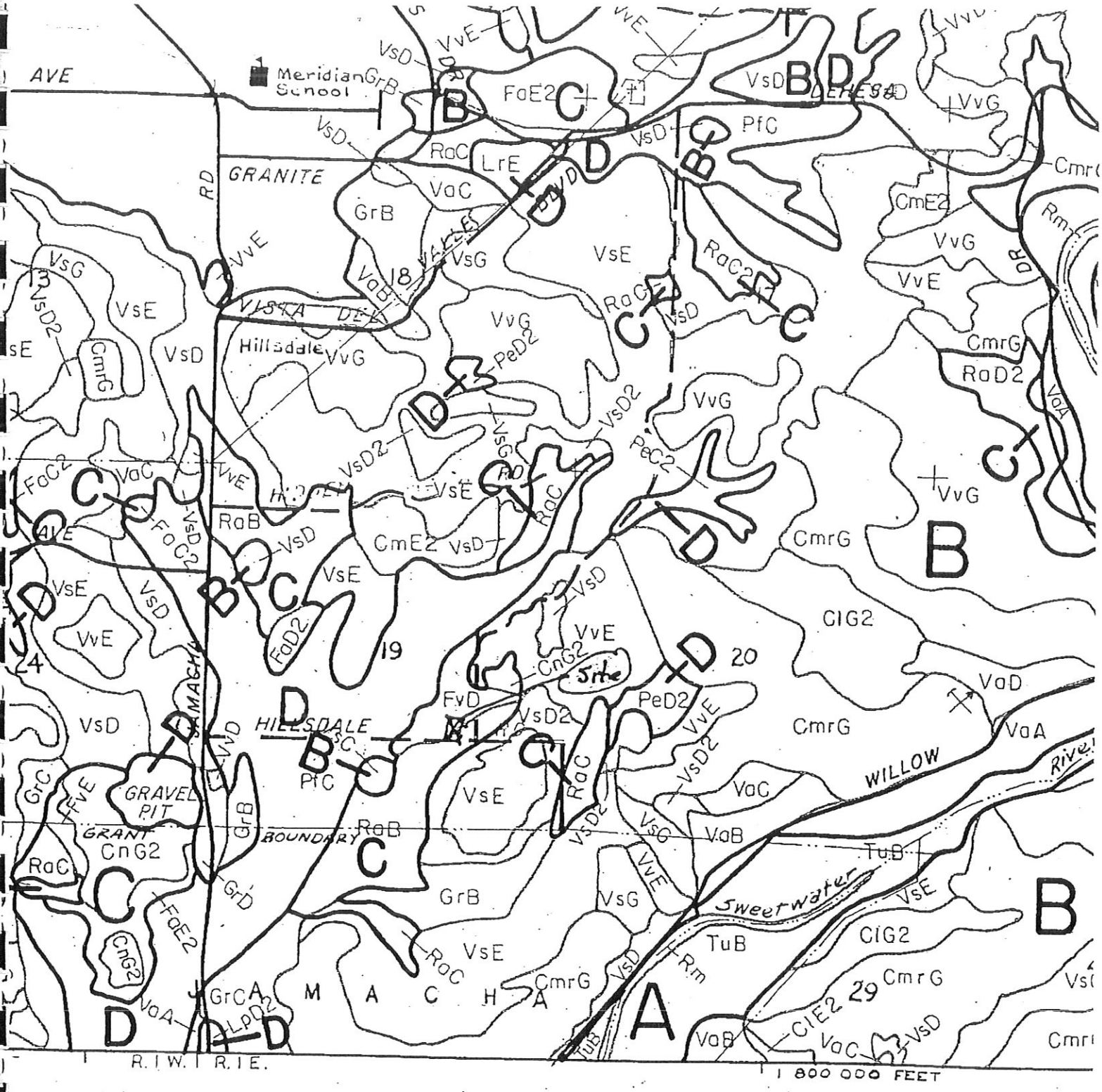
- Group A
- Group B
- Group C
- Group D
- Undetermined
- Data Unavailable

DPW GIS
Department of Public Works Geographic Information Services

SanGIS
We Have San Diego Covered!

N
W E
S

3 0 3 Miles



CAUTION NOTES:

1. User is urged to refer to corresponding SUPPLEMENTAL DATA SHEET for assumptions, criteria, map sources, additional legend items, and necessary explanation of ratings shown on map.

2. This map does not eliminate the need for detailed on-site investigation of the soil and site to determine precise soil conditions prior to undertaking any construction, grading, planting, or other soils related activity.

p D

High Runoff

ial

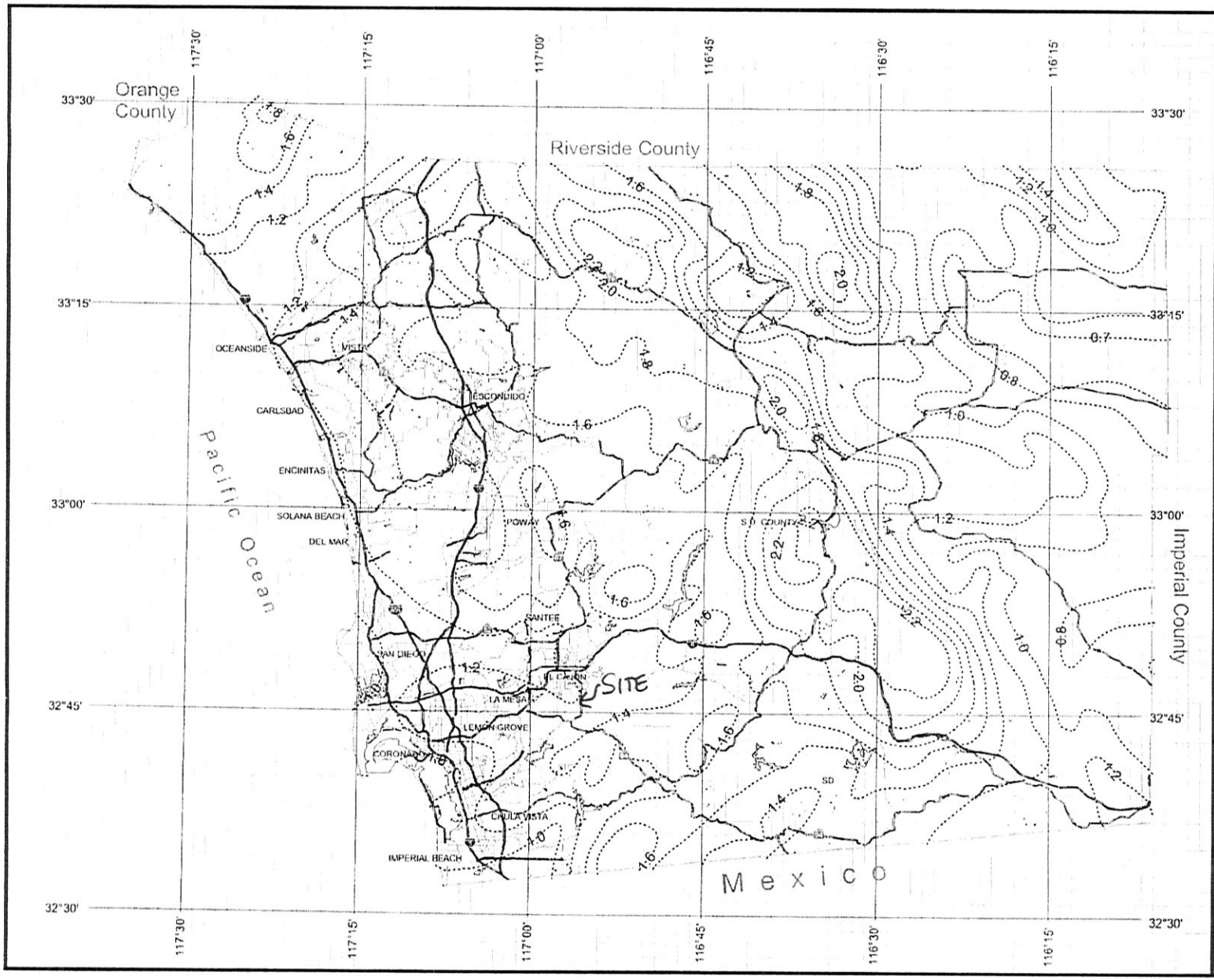
Base Map Source: U. S. Geological Survey with California State Coordinate System, Zone 6 Indicated

Prepared by: U. S. Department of Agriculture, Soil Conservation Service

FEDERAL ASSISTANCE — The preparation of t
financed in part through a comprehensive planning g
Department of Housing and Urban Development.

SHEET NAME

APPENDIX G



County of San Diego Hydrology Manual

Rainfall Isopluvials

2 Year Rainfall Event - 6 Hours

Isopluvial (inches)

DPW GIS

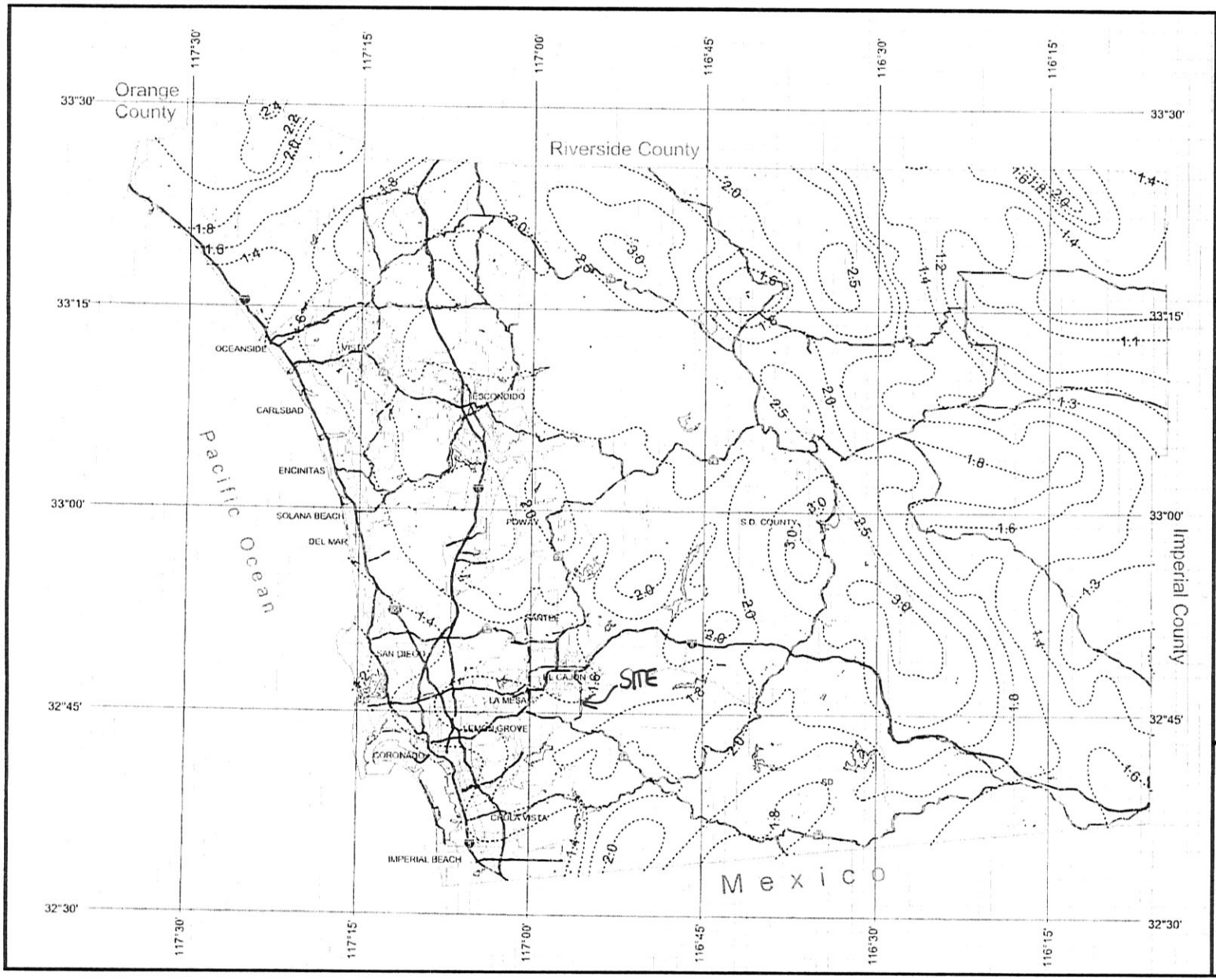
SanGIS

N W E S

3 0 3 Miles

County of San Diego Hydrology Manual

Rainfall Isopluvials



5 Year Rainfall Event - 6 Hours

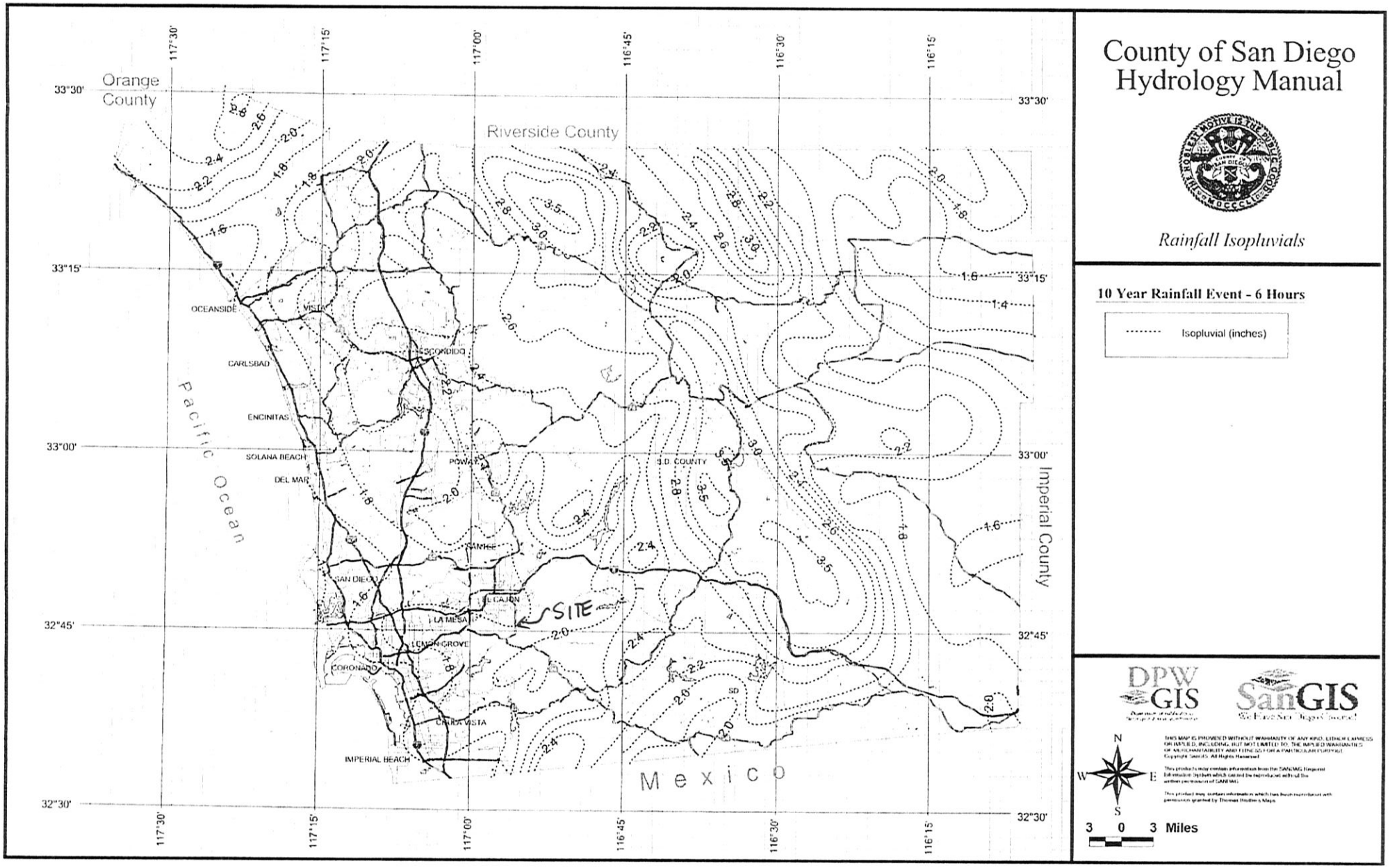
Isopluvial (inches)

DPW GIS

SanGIS

N W E S

3 0 3 Miles



County of San Diego Hydrology Manual

Rainfall Isopluvials

10 Year Rainfall Event - 6 Hours

Isopluvial (inches)

DPW GIS

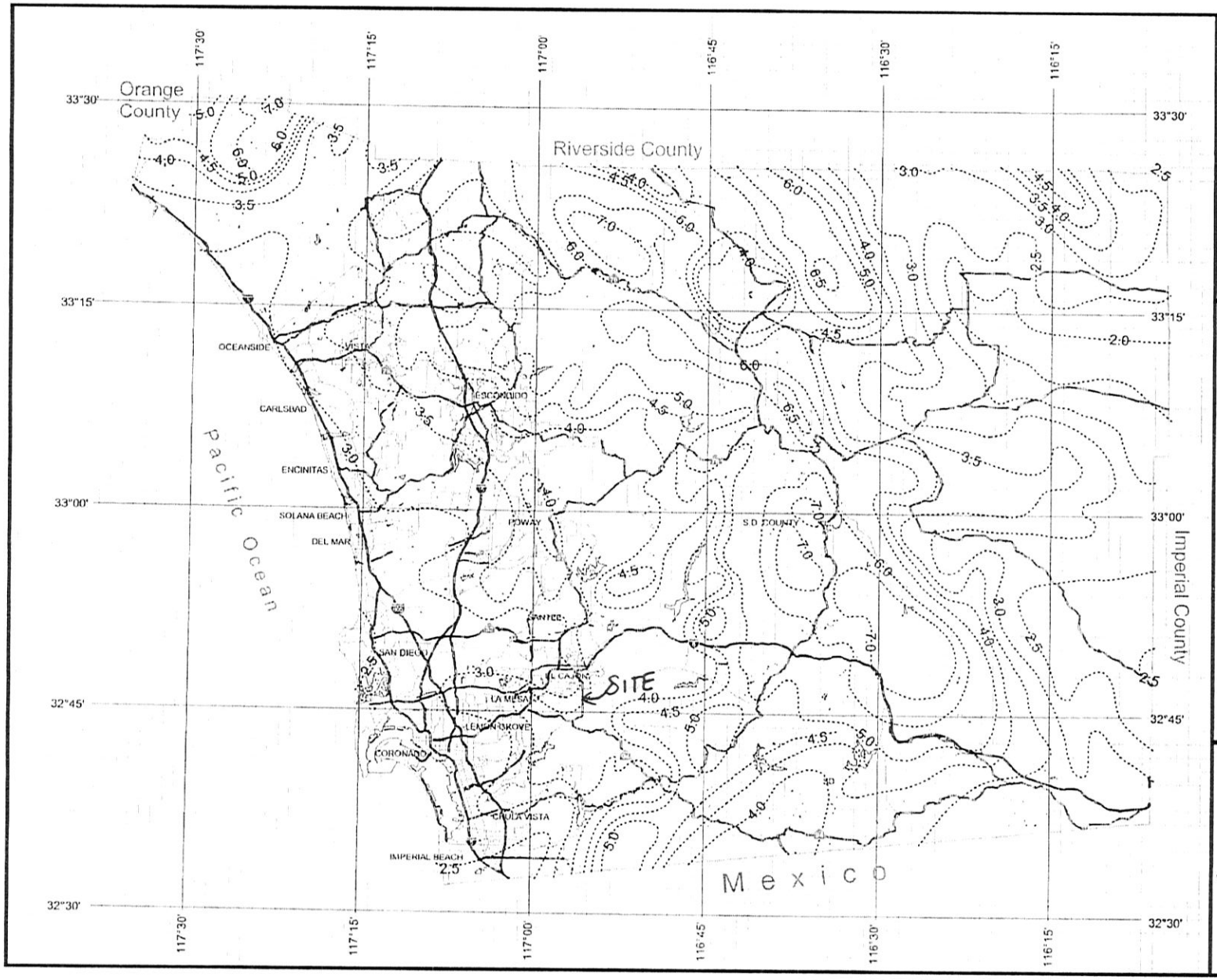
SanGIS

N

W E

S

3 0 3 Miles



County of San Diego Hydrology Manual

Rainfall Isopluvials

10 Year Rainfall Event - 24 Hours

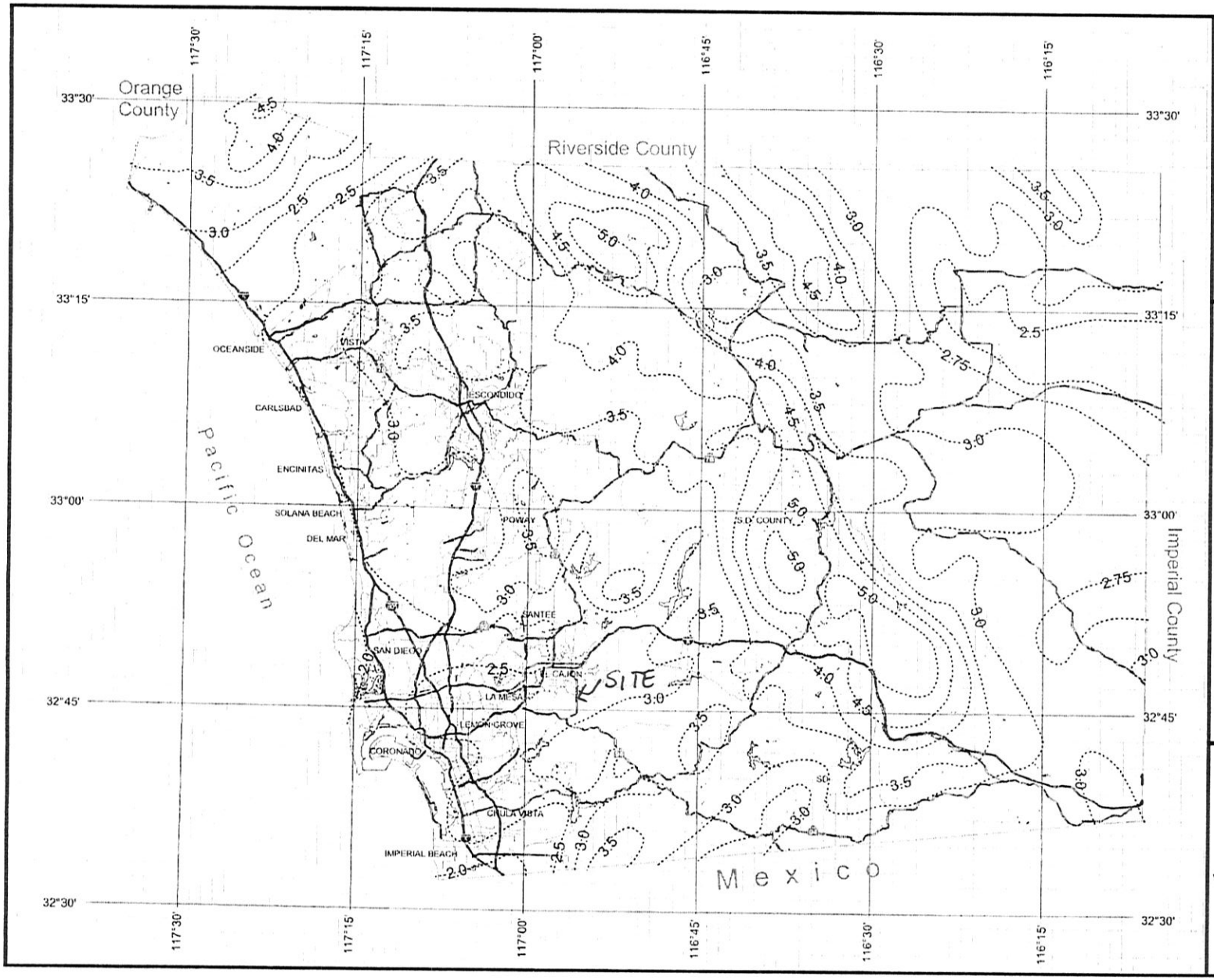
Isopluvial (inches)

DPW GIS

SanGIS

N W E S

3 0 3 Miles



County of San Diego Hydrology Manual

Rainfall Isopluvials

100 Year Rainfall Event - 6 Hours

Isopluvial (inches)

DPW GIS

SanGIS

N W E S

3 0 3 Miles

APPENDIX H

RUNOFF VOLUME CALCULATIONS FOR DETENTION

Basin A:

Area = 2.9 acres
Runoff Coefficient: Existing Conditions =0.30; Proposed Conditions = 0.42
10 year; 24 hour precipitation = 3"

V (existing) = 2.9(43560)(0.30)(3/12)= 9474 Cu. Ft.
V (proposed) = 2.9(43560)(0.42)(3/12) = 13,264 Cu. Ft.

Additional Volume of runoff = 3790 Cu. Ft = 40% increase

Area of Catchment = 88933 s.f (Refer to Attachment E-2)

Use "C"= 0.42

V=88933(0.41)(3/12) = 9338 Cu. Ft.

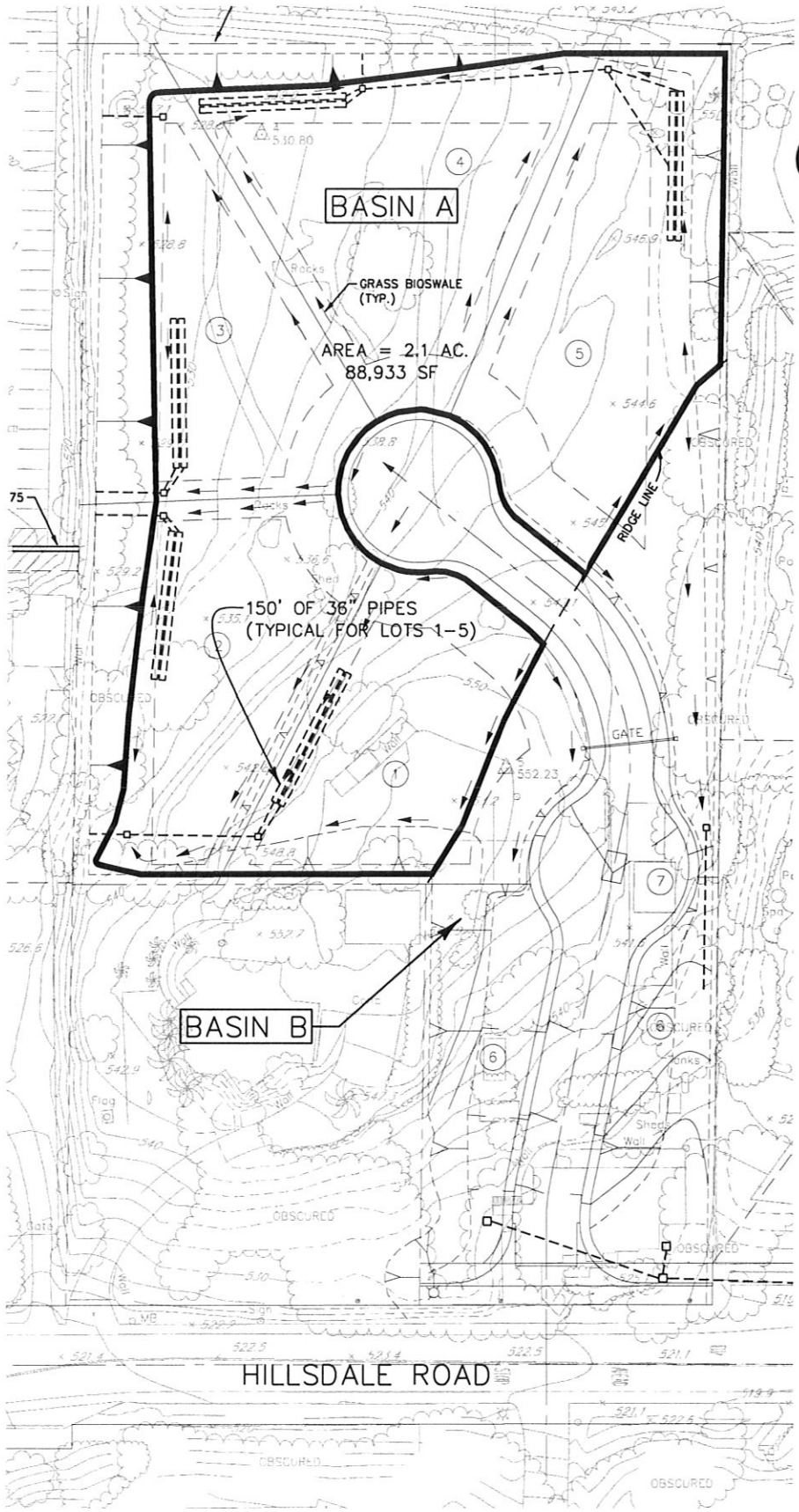
Actual percentage of detention = 3790/9338 = 40.6%

Use Lot size = 25,000 S.F.

Volume detained on each lot = 25000(.42)(3/12)(.406) = 1066 Cu. Ft.

L=1066/Area of pipe=1066/3.14(1.5)(1.5)=150 LF (36" PIPE)

USE 150' OF 36" PIPE FOR DETENTION ON LOTS 1-5



LEGEND:

AREA OF RUNOFF CATCHMENT

DETENTION FACILITY: STORAGE PIPES

80 0 80 240

Scale 1"=80'

RUNOFF VOLUME DETENTION EXHIBIT

DATE:12-05-08	W.O. 12511	DRFT: MC	CHK'D BY: AJ

LINTVEDT, McCOLL & ASSOCIATES
•PLANNING •CIVIL ENGINEERING •LAND SURVEYING
2610 Camino Del Rio South, Suite 200, San Diego, CA 92108 •(619)294-4440 •Fax(619)294-4442